

APPLICANT(S): GUERIN, Samuel et al.
SERIAL NO.: 10/575,240
FILED: January 30, 2007
Page 2

REMARKS

The present response is intended to be fully responsive to all points of objection and/or rejection raised by the Examiner and is believed to place the application in condition for allowance. Applicants assert that the present invention is new, non-obvious and useful. Prompt consideration and allowance of the claims is respectfully requested.

Status of Claims

Claims 5 and 6 are pending and have been rejected.

CLAIM REJECTIONS

35 U.S.C. § 103 Rejections

In the Office Action, the Examiner rejected claims 5 and 6 under 35 U.S.C. § 103(a) as being unpatentable over Barkley (U.S. Patent No. 2676114). Applicants respectfully traverse this rejection in view of the remarks that follow.

The present invention relates to an improved process for the co-deposition of materials on a substrate in progressively varying relative amounts. The aim is to be able to produce controlled libraries of a wide compositional range quickly and easily, with the deposition profile and rate of each material (i.e., from each source) being able to be controlled independently in a straightforward manner. Co-deposition of materials in this way allows the synthesis of libraries with a large compositional range without the need for subsequent heat treatment to achieve mixing of the components, as would be required with sequential deposition methods known in the art. The process of the invention finds particular utility in, for example, screening of non-equilibrated metal alloys and in the synthesis of mixed metal oxides, nitrides and hydrides.

There are several key features which make the co-deposition method according to the present invention possible, including the following: (1) there are multiple sources, each depositing a different material; each source has its own mask, i.e., there is a mask per source; (2) the geometrical arrangement of the substrate and each source and mask set is as defined in

the claims; and (3) the process is achieved without the need to change the geometrical arrangement during the deposition.

Applicants note that the above key features are clearly expressed in the claims. For example, the wording "at least two vapor materials" expresses the fact that a least two different materials are deposited; the wording "the path of the vaporized material from each vapor source to the substrate is partially interrupted by a corresponding mask" in the step of "depositing" expresses that there is a mask per source; the geometrical arrangement is now clearly expressed mathematically in the claims; and the fact that the geometrical arrangement does not change during the deposition process is clear from the wording "wherein each mask is moveable but is not moved in the course of the deposition method".

Barkley discloses a method of producing grated coatings and discusses shadowing of multiple point sources, thereby resulting in "steps" (e.g., Figs. 4, 14 and 16) rather than a continuously varying gradient. Fig. 7 of Barkley shows that continuous variation can be obtained only by tilting the sources, which is technically hugely demanding. Thus, Applicants believe that the teaching of Barkley is not relevant to the problem addressed by the present invention.

However, the Examiner contends that Barkley discloses "a method of simultaneously depositing at least two vapor materials from vapor sources on a single substrate, the path of the vaporized material from each source being interrupted by an associated mask" and supports this contention by reference to Fig. 5 of Barkley. However, Applicants point out that Fig. 5 has a number of key differences as compared to the present invention. The most obvious difference is that only a single mask 50 is provided, and not a mask per source. A second key difference is that Fig. 5 of Barkley clearly shows the use of 'point' sources, which can only produce stepped, rather than smooth, deposition gradients (see, e.g., Barkley's Fig. 4 for a stepped deposition profile). The present invention does not include point sources within its scope (the source has extremities (C_1 , C_2) and a size C).

The Examiner next contends that, according to Barkley, "the positioning of the mask in a plane parallel to the plane defined by the substrate [is] such that the material is deposited on the substrate in a thickness which increases substantially continuously in a direction along the substrate", referring to Figures 6, 7 and 9 of Barkley. In this regard, Applicants point out that

Figure 6 again has just a single mask 50, and not a mask per source. Figure 6 also uses point sources, and thus produces a stepped gradation. Finally, Figure 6 clearly fails to satisfy the claimed geometry (especially with regard to H_x).

Similarly, Figure 7 has a single source and single mask, and so is clearly not usable in a combinatorial process such as the present invention. The mask positioning also fails to satisfy the claimed geometry (especially with regard to H_x). Finally, it is worth noting that the source is a wire filament (i.e., a 1-dimensional finite source; Col. 6, line 10), which is not the focus of the present invention (the present invention is most useful when 2-dimensional finite sources are used). Finally, Figure 9 is very similar to Figure 6, except that a second mask is provided very close to the substrate, which is used to “cut off” the area 104 (see the paragraph bridging Columns 6 and 7). This second mask is therefore not relevant in the context of the present claims.

Based upon the above, it is clear that Barkley does not disclose any system which allows different materials from different sources to be deposited on a substrate with differing thickness gradients, and so does not provide the combinatorial possibilities according to the present invention.

In addition, the Examiner’s comment regarding the moveability of the masks appears to miss the relevance of the corresponding feature in our claims (“wherein each mask is moveable but is not moved in the course of the deposition method”). As already noted, a key advantage of the present invention is that the system can be set up prior to commencement of the deposition process (e.g. in a vacuum chamber), and the library of compositions can be achieved without the need for any movement of the masks during the deposition. This greatly simplifies prior art processes which rely on moving the masks during deposition.

Furthermore, the Examiner contends that Barkley teaches the geometrical arrangement required by the claims, because “Barkley shows the same position of the masks in the Figures”. However, Applicants point out that this is not true. First, the only drawings in Barkley that can be said to be at all relevant for comparison is Figure 7, as all of the others relate to point sources. It is immediately clear from looking at Barkley’s Figure 7 that the position of the mask 80 is not as required by the present claims, not least of all because the mask is not at a distance greater than H_y from the substrate.

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Page 5

With further regard to the geometrical arrangement, Applicants respectfully contend that it is not correct of the Examiner to suggest that the positioning of the masks is a matter of mere routine experimentation. In fact, as one with even ordinary skill in the field of vapor deposition and combinatorial chemistry techniques knows, the positioning of the masks is not a matter of routine experimentation but rather is the product of detailed technical thought and calculations.

Accordingly, claims 5 and 6 are not rendered obvious by Barkley, and Applicants respectfully request that the Examiner withdraw this rejection.


Conclusion

In view of the foregoing amendments and remarks, Applicants assert that the pending claims are allowable. Their favorable reconsideration and allowance is respectfully requested.

Should the Examiner have any question or comment as to the form, content or entry of this Amendment, the Examiner is requested to contact the undersigned at the telephone number below. Similarly, if there are any further issues yet to be resolved to advance the prosecution of this application to issue, the Examiner is requested to telephone the undersigned counsel.

Please charge any fees associated with this paper to deposit account No. 50-3355.

Respectfully submitted,


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